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NOMINATION—COMMERCE

HEARING

BEFORE THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

SECOND SESSION

ON

NOMINATIONS

FEBRUARY 7, 1990

JOHN W. LYONS, TO BE DIRECTOR, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, DEPARTMENT OF COMMERCE

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Committee on Commerce, Science, and Transportation

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CONTENTS

	Page
Opening statement by Senator Gore	1
Opening statement by the Chairman	5

LIST OF WITNESSES

Lyons, Dr. John W.	45
Biographical sketch	6
Prehearing questions of the Committee and the answers	8
Boehlert, Hon. Sherwood, U.S. Representative from New York, statement	3
Morella, Hon. Constance A., U.S. Representative from Maryland, statement	3

NOMINATION—COMMERCE

WEDNESDAY, FEBRUARY 7, 1990

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 2:40 p.m., in room SR-253, Russell Senate Office Building, Hon. Albert Gore presiding.

Staff members assigned to this hearing: Pat Windham, professional staff member and Ruth Johnson, minority professional staff member.

OPENING STATEMENT BY SENATOR GORE

Senator GORE. The hearing will come to order.

I want to welcome you, Dr. Lyons, and our guests in the audience, members of your family and others. We will be hearing from Congressman Boelhert and Congresswoman Morella when they return from the House vote. I would apologize to them as I am now doing to you for the ten-minute delay in getting started. It was really an unavoidable delay. In any event, I am delighted that they came and that you are here.

This hearing, of course, is on the nomination of Dr. John Lyons to be Director of the Commerce Department's National Institute of Standards and Technology. NIST remains the one Federal laboratory with an explicit mission to help U.S. industry. It has long provided industry with the precise measurement techniques and data needed to improve quality, lower costs and speed the commercialization of new products.

Now under the 1988 Trade Act NIST has three additional responsibilities: generic technology development; technology extension activities; and a new advanced technology program to provide seed money on a matching basis for industry research projects in critical areas.

Dr. Lyons has been nominated at a time when NIST and its programs are more important than ever. Our Nation's prosperity and strength depend upon whether we stay competitive in both high technology and general manufacturing. We know the challenge that the U.S. faces in such critical areas as semiconductors, advanced computing, high definition technology, biotechnology and other fields. We know that increasing numbers of Americans are worried about our Nation's economic future, and we know that both government and industry must become more serious about maintaining our Nation's technological strength. NIST plays a pivotal role in that effort.

I am pleased that the President's new budget proposes increased funding for NIST, including the first request from this administration for NIST's new technology extension activities and its advanced technology program. I am much less pleased, however, about the relative priorities reflected in the President's budget. It requests only $10 million for the advanced technology program out of a total R&D request of $71 billion.

NIST is the Federal agency which does the most to support civilian industrial competitiveness; yet, the total amount requested for the agency, $198 million, represents only three-tenths of 1 percent of the total R&D request.

Similarly, the budget proposes that Federal agencies receive only a $21 million increase for the government's high performance computing initiative. In spite of strong support for this program from Congress, the industry, the White House Science Office and virtually everyone who has examined the need for this proposal, what we see instead are huge proposed increases for a small number of megaprojects, most of which take no direct contributions to competitiveness, the environment or health.

It is time that this Nation's R&D budget places national economic security and other urgent needs such as the environment on the same level with traditional priorities like military strength.

I intend to look closely at this issue of priorities as the year proceeds. I know my colleagues share these concerns. The President's new budget reflects some progress but, in my personal opinion, not nearly enough.

This afternoon, however, we will focus explicitly on NIST and its new director-designate. Dr. Lyons comes to this position with considerable experience both in government and industry and since 1978 has directed NIST's National Engineering Laboratory, the largest of the agency's four principal divisions.

Before that, he headed the agency's Center for Fire Research, and, in fact, he is a nationally recognized expert on the chemistry and control of fire.

Before joining the Commerce Department, he spent 18 years with Monsanto. He did his undergraduate work at a distinguished university in Cambridge, one that I know well, and then received a Ph.D. in physical chemistry from Washington University in St. Louis.

He is also a member of the National Academy of Engineering.

Dr. Lyons, you and I have had the opportunity to work together and to exchange ideas and dialogue at hearings like this one on several occasions, and I want to welcome you as a friend as well as a nominee. I would like also to welcome members of your family who join you today: your wife, Grace; and your sons, Louis and John. We are deligthed that they could be present here today.

Senator GORE. Sherry Boehlert is an old friend from the House Science Committee and Ranking Member on the subcommittee that oversees this. Connie Morella represents the district where NIST is based. We are honored that both of you would come and join us today.

Ms. MORELLA. I defer to the Ranking Member since I am on that subcommittee, too.

Senator GORE. Congressman Boehlert, please give us your words of wisdom.

STATEMENT OF HON. SHERWOOD BOEHLERT, U.S. REPRESENTATIVE FROM NEW YORK

Mr. BOEHLERT. Thank you, Mr. Chairman. It is a pleasure to be here this afternoon to help introduce Dr. John Lyons. I know he needs no introduction to you.

I think it is fair to say that all of us on the House Committee on Science, Space, and Technology have come to know and admire Dr. Lyons in his able leadership of the National Engineering Laboratory, which is the largest division of the National Institute of Standards and Technology.

I have been impressed with John's breadth of knowledge and interest, his responsiveness, his willingness to experiment with new programs, and his sensitivity to the needs of industry and to the consequences of NIST's activities on the Nation's ability to compete. John is familiar with the inner workings of NIST; yet, he is flexible and open to change. How refreshing that is.

I am sure you will come away from these hearings with the same sense of confidence in Dr. Lyons that we in the House Science Committee have. I hope today's session can be followed by a quick confirmation not only for the future of NIST but, quite honestly, because we need him as a budget witness by the end of the month.

Thank you, Mr. Chairman.

Senator GORE. He has a way with words, does he not?

Congresswoman Morella.

STATEMENT OF HON. CONSTANCE A. MORELLA, U.S. REPRESENTATIVE FROM MARYLAND

Ms. MORELLA. Thank you very much, Mr. Chairman. It is a pleasure for me to be here, and to add my comments to that of the ranking member of my committee, my distinguished colleague, Mr. Boehlert, for the confirmation hearing for Dr. John Lyons as Director of the National Institute of Standards and Technology. It is difficult to find anyone who knows more about NIST and its workings. Since learning of the nomination, I can honestly say I have heard only praise about this gentleman.

NIST, as you mentioned, Senator Gore, is in my district. It is the oldest national laboratory, one that serves industry, and one that is a key to competitiveness. Much extra authority and responsibilities were given to it through the Trade Bill. Technology transfer is foremost in terms of what NIST does in their advanced technology programs.

Now John, as you know, is no stranger to NIST. He has had a variety of top level positions since first being affiliated with the National Bureau of Standards as it was then called in the 1970s.

In addition, he spent a number of years in an area which I consider very important, but is often overlooked by the public. He has been involved in the prevention and control of fires, even serving as the Director of NIST's Center for Fire Research until 1977. He has also served as Acting Deputy Director of NIST and currently as Director of the National Engineering Laboratory.

To his credit, Dr. Lyons was elected as one of the youngest members of the prestigious national Academy of Engineering, as well as a number of other professional institutions and associations.

In addition, he has received several awards, including the Presidential Rank Award of Distinguished Executive.

In the private sector, he served in various research and development positions at the Monsanto Company from 1955 to 1973. He has authored three books and many, many articles.

Putting all John Lyons' background together, I believe that he has had at least some experience in virtually every area in which NIST has been given new directives. For example, he has been involved in research and development in both the private and public sectors; study and academic work in a variety of scientific and technical disciplines; he has experience as a published writer of note; and he has served as adviser to many different organizations and committees.

I believe he has the education, the experience, the professional involvement, the temperament and the commitment to make us very proud of NIST and to make our Nation primary in terms of competitiveness.

Finally, I would say in the words of Shakespeare, "he is a man of sovereign parts, and he is esteemed, well fitted in arts, glorious in arms. Nothing becomes him ill that he would well"; and I know he would wish NIST well.

I thank you very much.

Senator GORE. Well, that is a pretty praiseworthy statement there.

Do you want to amend your statement, Mr. Boehlert? I thought you were a little light on your praise.

I am just kidding you.

Let me tip my hand. The two of you have demonstrated to the committee how well you think of Dr. Lyons, and I will tip my own hand. I think very highly of him, too. I have had a chance to work with him and this is not going to be a controversial matter. Every once in a while this administration really sends up a good appointment.

We are proud to have you before us today.

I might say that the committee is quite well aware that the House has a string of votes this afternoon and a very busy agenda. We will certainly understand if you two have to get back to your business. You are welcome to stay as long as you can, but I know that the bells are ringing. We want to demonstrate an understanding of the pressures on your time.

Again, thank you very much for your excellent statements on behalf of the nominee.

Ms. MORELLA. Thank you, Mr. Chairman.

Mr. BOEHLERT. Thank you, Mr. Chairman.

Senator GORE. Send me a copy of that Shakespeare quote. I would like to have that on file. Thank you.

I have a statement that the Chairman, Senator Hollings would like to have included in the record.

[The statement, biographical sketch, and questions and answers follow:]

OPENING STATEMENT BY THE CHAIRMAN

I am pleased that the Committee is holding this afternoon's hearing on the nomination of Dr. John W. Lyons to be Director of the Commerce Department's National Institute of Standards and Technology (NIST).

This agency has long been one of the best-kept secrets in the government, an impressive Federal laboratory that has provided vital technical services and support to U.S. industry since 1901. It is the one national laboratory with an explicit mission to help industry. Because I saw what the agency already had done, and because I saw how much more it could contribute to the nation, I authored the 1988 legislation that upgraded the old National Bureau of Standards (NBS) into NIST and not only maintained its traditional, and vital, role in measurement services but also gave it new responsibilities in generic technology, technology extension, and working with industry to develop new advanced technology. NIST and the new office of the Under Secretary for Technology now have the authority and the potential to give American industry the tools it needs to speed the commercialization of new products, to modernize manufacturing, and generally to keep U.S. industrial technology competitive into the next century.

NIST's expanded mission is a big one, and an important one, and it requires that the agency have a first-rate director. John Lyons appears to have the experience and expertise to lead the agency well. I am impressed by the fact that he has extensive experience in both industry and Federal service, and that he is intimately familiar with NIST's programs. His membership in the prestigious National Academy of Engineering also speaks well of his capabilities.

I am pleased that the Administration has selected someone with such solid credentials, and I look forward to reviewing Dr. Lyons' hearing statement and his answers to our pre-hearing questions.

ERNEST F. HOLLINGS, SOUTH CAROLINA, CHAIRMAN
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WALTER B. MCCORMICK, JR., MINORITY CHIEF COUNSEL AND STAFF DIRECTOR

United States Senate
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
WASHINGTON, DC 20510-6125

STATEMENT FOR COMPLETION BY PRESIDENTIAL NOMINEES

(If more space is needed, please use attached REMARKS sheet)

A. BIOGRAPHICAL DATA

1. Name: LYONS (Last) John (First) Winship (Other)

Address: 7430 Woodville Road (Current residence)
Mt. Airy, MD 21771

National Institute of Standards and Technology (Business)
Gaithersburg, MD 20899

2. Position to which nominated: Director, National Institute of Standards and Technology

Date of nomination: November 17, 1989

3. Date of birth: November (month) 5 (day) 1930 (year)

Place of birth: Reading, Massachusetts

4. Marital status: Married

Full name of Spouse: Grace Catherine Lyons

5. Names and ages of children:

Margaret E. Lyons	35	John Hanley Lyons	29
Mary Ann Lyons	32	Louis Martin Lyons	22

6. Education:

Institution	Dates attended	Degrees received	Dates of degrees
Harvard College	1948-52	A.B.	1952
Washington Univ. (St. Louis)	1961-64	A.M.	1963
Washington Univ. (St. Louis)	1961-64	Ph.D.	1964

7. Employment record: List all positions held since college, including the title or description of job, name of employer, location of work, and dates of inclusive employment.

From	To	Name of employer	Address	Type of work
1953	- 1955	U.S. Army		
1955	- 1973	Monsanto Co.	St. Louis, MO	Various positions in r&d from bench research to department manager.
1973	-present	Ntl. Institute of Standards & Technology	Gaithersburg, MD	r&d manager

8. Government experience: List any experience in or direct association with Federal, State, or local governments including any advisory, consultative, honorary or other part-time service or positions.

1978 -present	Director, National Engineering Laboratory, NIST
1973 - 1978	Director, Center for Fire Research, NBS
1975 - 1978	CoChairman, U.S.-Japan Natural Resources Committee on Fire Research
1981 - present	Member, Advisory Committee on Engineering, NSF
1980 - present	Member, Board of Visitors, College of Engineering, U of Md
1985 - present	Member, Visiting Committee, Naval Research Laboratory
1983 - present	OSTP Policy Committee on Federal Labs
1982 - 1983	Maryland State Board for Higher Education, Comm. on Eng. Education

9. Political affiliations activities: List all memberships and offices held in or financial contributions and services rendered to all political parties or election committees during the last 10 years.

NONE

10. Memberships: List all memberships and offices held in professional, fraternal, scholarly, civic, charitable, and other organizations.

1955 - present	Member, American Chemical Society
1971	Chair, St. Louis Section, American Chemical Society
1956 - present	Member, American Association of Advancement of Science
1965 - present	Member, Sigma Xi
1973 - present	Harvard Club of Washington, DC
1974 - 1979	Chairman, Products Research Committee
1975 - present	Member, Washington Academy of Science
1978 - 1984	Member, Bd. of Dir., National Fire Protection Association
1981 - 1985	Member, AIChE
1985 - 1987	Member, Board of Directors, ASTM
1985 - present	Member, National Academy of Engineering

11. Honors and awards: List all scholarships, fellowships, honorary degrees, honorary society memberships, and any other special recognitions for outstanding service or achievement.

Sigma Xi

National Academy of Engineering (elected 1985)

PREHEARING QUESTIONS ON THE NOMINATION

OF

JOHN W. LYONS

GENERAL

1. The Technology Competitiveness Act (sections 5101-5164 of the Omnibus Trade and Competitiveness Act of 1988) significantly upgraded the mission and programs of what is now the National Institute of Standards and Technology (NIST). What do you see as NIST's most important activities and responsibilities in the 1990's? If confirmed, what will be your highest priorities?

A. The most important activities and responsibilites at the National Institute of Standards and Technology (the Institute) in the 1990's will be those to help U.S. industry commercialize technology. The Institute was established to help industry at a time when technology was changing rapidly and Congress saw the need for services of a central laboratory. At various times in the intervening 88 years these services have been provided to industry, other Federal agencies, state and local governments, universities and the scientific and engineering communities at large. Sometimes concerns other than industry have been uppermost, as in wartime, but for the most part American industry has been the principle client for the Institute's work. During the past dozen years the Institute has increased steadily its development of technologies and technical services needed by our industry. As we enter the nineties the need for this kind of work seems more urgent than ever as we all seek to improve our Nation's competitiveness in global markets.

If confirmed, I shall make my top priorities the following:

a. To provide more services to U.S. industry to help improve quality, costs, and speed of market response by focusing on

additional technical support services; and looking at different ways to develop generic aspects of new technologies.

b. To provide technical support to a number of efforts in health and safety services where we have special capabilities.

c. To contribute to progress in scientific and engineering research both by our research and by supporting services to the research community.

2. Please state why you believe that the research and technical services provided by NIST contribute to U.S. industrial performance and productivity. In particular, how have the precise measurement methods and other quality assurance tools that NIST has given U.S. companies helped them (a) to improve manufacturing and (b) to turn laboratory discoveries into successful commercial products?

A. a. The Institute's technical services improve manufacturing practices in a number of important ways leading to better quality and lower costs. Some examples are:

1) Better process design. Design is improved by application of our reference data on materials and process fluids. The data enable design of more cost-effective unit processes both by improving unit efficiency and by eliminating the need for overdesign to overcome the lack of accurate knowledge.

2) Improved process control systems. We provide new sensors and sensing techniques, architectures for control systems, and models and protocols for communications within automated control systems.

3) Integrated process automation. We are assisting industry with integration of automated machines into full systems. Our program in factory automation has for several years been providing services to industry. The Automated Manufacturing Research Facility serves as the public test bed for new concepts in quality

assurance in the automated factory of tomorrow, new control hierarchies, new interfaces, new modular structuring of the automated factory, and new devices and techniques necessary to enable the integration. This program has now an impressive list of successes, some of which are listed in the attachment.

b. The Institute's technical services speed the movement of discoveries to the marketplace by:

1) helping industry to characterize the new products; for example, by determining structure of new molecules, supplying phase diagrams of new compositions such as the high-temperature superconductors, providing new ways to measure technical aspects of a new product, such as microdomains of magnetic materials.

2) developing ways to measure the performance characteristics of new product families in their intended uses. Examples are electrical characteristics of integrated circuits, patterns and gains for antennas, toughness of advanced ceramics, and the like.

3) developing the needed tests and helping secure consensus on them for establishing fair and equitable buying and selling of new products in the marketplace. We have developed some two dozen procedures for specifying optical fibers alone.

Recently the Institute's Visiting Committee issued a report on the impacts of the Institute work. We have provided the Commerce Committee with a copy of this report.

NIST Programs and Organizations

3. The fiscal year (FY) 1990 appropriation for NIST includes $10,000,000 for the Institute's New Advanced Technology Program (ATP). The Senate Appropriations Committee report states that the Committee "intends that these funds be used to encourage and assist industry-led joint research and development ventures in such economically strategic areas as advanced electronics, advanced manufacturing technology, and superconducting materials." What steps has NIST taken to carry out these instructions and implement the program? When will industry be able to apply for these funds, and when does NIST intend to make awards? How many awards are likely to be made in FY 1990?

A. My colleagues and I in the Commerce Department have held a series of discussions with interested parties in industry and in government about the Advanced Technology Program. These discussions have been followed by drafting of a Federal Register notice describing the thrust and shape of the program. The notice is in the clearance process and should be published soon. A 30 day period for comments is provided followed by a second notice describing the process for application, review of proposals and awards. Industry should be able to submit applications by early summer. We shall work hard to make these awards in this fiscal year. We have no precise rules for how large the awards should be. However, I believe the program should be focused on a few important areas and should be large enough in each area to make a difference. This argues for a relatively few large awards.

4. The FY 1989 appropriation for NIST's core laboratory program was lower than the FY 1988 appropriation, and the FY 1990 figure is only slightly higher than the FY 1989 level. In effect, NIST's laboratory program has been frozen for the past two years, despite new responsibilities under both the Omnibus Trade and Competitiveness Act of 1988 and the Computer Security Act of 1987. In your judgement, what has been the effect of these budget levels on the laboratory program and NIST's ability to carry out its responsibilities?

A. The Institute's budget has been more or less steady for the past twenty years. This is reflected in the constant or slightly declining staffing levels at the Institute since the late 1960's. During the 1980's when the Federal research and development budgets increased significantly, the Institute did not share in the build-up but rather received inflation adjustments. The Institute's response to this has been to reprogram extensively by rolling over funding internally. In this way we have been able to launch some new high-priority programs within a zero-sum game. I am pleased to say that the President's budget for the Institute for FY 1991 is a strong statement of support for all of our programs, and there are solid proposals for computer security and new programs under the Technology Competitiveness Act of 1988.

5. In December 1988, the Department of Commerce (DOC) announced the first three awards under NIST's new program of Regional Centers for the Transfer of Manufacturing Technology. In your judgment, how well have these three centers performed during their first year? Are they effectively aiding small manufacturing firms in their respective regions?

A. The Institute program of Regional Centers for the Transfer of Manufacturing Technology was first implemented one year ago. We made three awards: one to a group in Cleveland, Ohio, one to the University of South Carolina, and one to Rensaeleer Polytechnic Institute in New York. Each of these is different in a significant way from the others; their performance represents a kind of experiment in respect to the differences. The Cleveland group has very close relations with and support from local big industry and is working in the midst of a very heavy concentration of small industry that is the target of the program. The South Carolina program is working through the state's technical colleges that were established to work with industry. The technical college network in South Carolina is unique to that state and we hope to show the strength of the system by moving automation technology through it. At RPI we have a very sophisticated research and development program in factory automation akin to the work at the Institute. We are anxious to see how small business in that region responds to very advanced concepts and how the New York Industrial Innovation Extension Service functions with RPI.

6. The FY 1990 NIST appropriation contains funds to start additional manufacturing centers. When will NIST invite applications for these centers, and when will the Institute make the next round of awards? Will NIST again ask the National Research Council to review the quality of the proposals?

A. I understand that the Secretary of Commerce, in keeping with his commitment to Chairman Hollings to evaluate the progress of the Centers, is planning on visiting a Center soon. He is deeply interested in the progress of the Centers. An early review, after two quarters of operation, shows that the program seems to be making solid progress. The funding for the Centers has to be multi-year so that the Center managers can make long-range plans. Recognizing this need, the Department is evaluating the funding available and the issues of future funding allocations for the Centers to make the best possible use of available resources.

7. The FY 1990 NIST appropriation also contains $1,300,000 for technology extension services as provided under section 26(b) of the NIST Act. The Senate report stated that these grants "will allow universities to provide high technology manufacturing, technical, and business development extension services to firms..." How will NIST implement this program? Do you personally agree that these extension programs can contribute to improving U.S. manufacturing productivity and quality?

A. The Institute proposes to use the $1,300,000 provided in the FY 1990 appropriations for technology extension services to do the following:

1. Establish a program of grants to the states to demonstrate methods by which the states can increase the use of Federal technology by businesses to help improve their competitiveness. This activity will include support of additional ways to increase business use of the services provided by the Institute's Regional Manufacturing Technology Centers. About $900,000 will be devoted to this aspect.

2. The balance of the funds will be used to prepare informational materials, conduct workshops and seminars, disseminate information to the states, and defray staff expenses.

I believe that this program can help improve the productivity and quality of manufacturing in the Nation. One of the startling developments of the past decade has been the emergence of state technology support programs. These efforts based in part in the state universities and in part in state economic development programs, are bringing the expertise within the states to business, especially small and start-up firms. The new program at the federal level can show the

states how to use Federally-developed technology. Most of the existing programs stress improvements in manufacturing and emphasize both productivity and quality.

8. Both the Center for Fire Research and the Center for Building Technology perform important research to help improve public safety, yet both also have suffered from major budget cuts in recent years. If confirmed, what will be your policy towards the two centers? Do you agree that they perform essential public safety roles? What resources would be necessary to restore them to the level of effort maintained in the late 1970's? If confirmed, will you place a high priority on these programs?

A. The Centers for Building Technology and Fire Research are important parts of the Institute community. I propose to treat them as such in the budget process. They will be treated in exactly the same way as the other technical units at the Institute.

Both centers provide technical services that help assure an acceptable level of public safety across the Nation. Both also serve the economic interests of the country since the object always is to provide the desired level of safety and integrity while maintaining costs under tight control. My judgement as to the appropriate level of resources required to do the job at the two centers will be based not on the past history of the budgets but on the demands placed upon the centers by changing technology and public demand and comparing these demands to the demands on the other technical programs at the Institute. Neither program is as it was in the 1970's. The Fire Center has placed most of its resources and emphasis on developing a comprehensive set of computer models of fire hazard and risk and uses these models to define its laboratory program on test methods and basic research. The Building Technology program faces exceptionally strong

demands for services related to earthquake preparedness and other threats to structural integrity. At the same time the construction industry is feeling the pinch of off-shore competition and is turning to computer-aided techniques to improve its competitiveness. The Center is supplying services related to computer-integrated construction to speed agreement on the needed protocols and standards to enable the industry to take advantage of the productivity increases inherent in this use of computer technology.

9. If confirmed, how do you propose to implement NIST's responsibilities under the Computer Security Act of 1987?

A. I propose to implement the Institute's responsibilities under the Computer Security Act of 1987 much as we are now. The standards that we are assigning the highest priorities to are signature authentication, key exchange, and data encryption. I plan to continue to consult with other agencies and the Congress about plans and priorities. I recognize the importance of our doing a good, thorough, and impartial job on this assignment. I am pleased to note that additional funding has been budgeted by the President for this work.

10. NIST has received major new responsibilities in recent years. Do you believe that NIST needs any internal reorganization in order to carry out traditional and new responsibilities more effectively? If so, what kind of reorganization will you propose?

A. If confirmed, I plan to examine carefully the structure of the Institute. The present organizational arrangement was put in place in 1978 and was designed to foster and nurture engineering and technology programs. This effort was very successful but the resulting reorientation of the programs has left the structure unbalanced and outmoded. I would prefer to operate from a more horizontal organization with fewer, larger program units.

11. NIST now has an experimental new personnel system, designed to give the Institute additional flexibility to use salary funds to hire and retain first-rate scientists and engineers. In your opinion, has this new personnel system been a success? Should it be made permanent?

A. The Personnel Demonstration Project at the Institute, begun in 1988, is coming along very well. The project was established in the 1987 NBS authorization legislation and covers all Institute staff except the wage grade employees. NBS was authorized to replace the normal civil service rules and regulations for hiring, classification, evaluation, promotion, awards, and salary administration with a new set tailored to the needs of a major research and development laboratory and designed to promote excellence in the staff and in the laboratory. The principal features of the new system are: direct hiring authority for all Institute staff covered by the demonstration project except the Senior Executive Service, classification by line managers, evaluation, awards, and salary changes based on performance, not seniority, recruiting and retention bonus authority, and a system designed to eliminate gradually the disparity in salaries between Institute and peer institutions in the private sector.

The first fruits of the project have come in recruiting. Because we have direct hire authority and have flexibility in what we can offer as a starting salary without checking outside the Institute, we find that we can move very rapidly on promising candidates. The time to make an offer has been reduced from

months to weeks and, in principle, can be reduced to on-the-spot timing. Our surveys of competitive salaries enable us to gauge well what it will take to make a competitive salary offer. We have set up our own system of four career paths and five salary levels within the paths. Line managers make the decisions and execute computerized administrative details on classification. The demonstration system requires that pay adjustments be linked to performance. We use formal performance agreements to define what is expected and then use the performance rating against the agreement to guide us in apportioning pay increase and award pools. We are currently engaged in fine tuning of the appraisal and salary administration aspects of the system and hope to have these changes in place before the end of the second quarter.

The demonstration system in no way reduces the protection the civil service affords its employees. I believe the new features are fair and effective and have enabled the Institute to hire and retain high-calibe. staff. This is especially true of the younger staff up through mid-career. The five-year demonstration period is over at the end of 1992. At that time we shall review our needs for extension and renewal.

12. Please briefly describe the technical services that NIST provides to the Department of Defense (DOD), including the Institute's calibration services and its contributions to improved manufacturing technology. Have these contributions helped DOD save money and improve reliability?

A. Institute work for the Department of Defense has grown by a factor of three over the past decade. In 1980 the funding was just over $19 million; in 1989 this had risen to over $58 million (both in 1990 dollars). The funding comes from many different parts of DoD so that the Institute is less vulnerable to cutbacks than it might appear. The projects supported by the DoD cover a wide spectrum of activities and range from very fundamental work sponsored, for example, by the Office of Naval Research, to applied efforts from the different commands. There are over 200 different projects at levels from a few tens of thousands to millions of dollars. Most are annual arrangements renewed each year.

A major and long-term area of support is in measurement services, especially calibration. The military has supported research leading to new measurement techniques and also obtains regular calibration services from the Institute for the military's primary standards. In 1988 these primary standards in almost 500 different DoD locations provided the basis for calibration of over 3 million items. Examples of special programs supported by Institute measurement research and services include MILSTAR, SDI, and MIMIC (microwave monolithic integrated circuits). These services keep military systems and components operating within

specification and thereby assure improved performance in service. Taking advantage of measurement support of this kind lies at the heart of managing for quality, or TQM (total quality management).

A long and fruitful relationship has been of particular interest to this Committee; namely, that between the Navy and the Institute program in factory automation. The Navy has been a cosponsor of the Institute's work on interface standards, control architectures, communications models, data format standards and the like for the fully automated factory of the future. The test bed for this work at the Institute is known as the Automated Manufacturing Research Facility. Results from the AMRF are now in use at the Navy's RAMP facility near Charleston, S.C. and are going into the Mare Island Shipyard on the west coast. These innovations improve turnaround time to produce a new part from hours to minutes - in one case from 17 hours to less than one hour. We expect the Navy's shipyards and contractors to achieve major economies from the technologies coming out of the joint Navy-Institute work.

13. What is the current relationship between NIST and the Defense Advanced Research Projects Agency (DARPA)? What do you see as the distinct roles and strengths of the two organizations, and do you believe that further cooperation would be beneficial?

A. The Institute and DARPA have been working well together for many years. DARPA has been a steadfast supporter of the Institute and has played a key role in developing some of the Institute's competencies. A case in point is the Institute semiconductor technology program. DARPA was the principal funder of this work in the 1970's and helped the Institute bring the program to maturity. We could not have become a significant contributor to this important industry without DARPA's early financing. In recent months the dialogue with DARPA has intensified, particularly in matters related to SEMATECH and to advanced image processing but also in other areas such a X-ray lithography.

DARPA's role in DoD is to use its considerable research and development purchasing power to stimulate delivery of new products based on advanced technology. A few areas in which we currently share interest are next-generation supercomputers, flat panel displays, advanced microprocessors for image analysis, and X-ray lithography systems. The applications are military, not civilian. On the other hand, the Institute's role is largely to support U.S. industry by providing high-leverage services to make industry's work more efficient and effective. These services are measurement methods and services, reference data and materials,

and generic and precompetitive information on products and processes. The two agencies work in different end-use markets by very different techniques . Both are concerned with strengthening the U.S. industrial base via the application of technology and we share many common interests. Closer relations would likely help both parties; I am pleased to note that this is occurring.

14. Under the authority provided by the NIST Act and the Federal Technology Transfer Act of 1986, NIST has entered into a growing number of cooperative research and development agreements ("CRADAs") with private industry. In your judgement, how are these collaborations working? Are they improving the transfer of NIST technology to U.S. companies?

A. The Institute has worked with U.S. industry for almost ninety years. We use a variety of mechanisms to promote these interactions. The CRADA is one. We have entered into about 70 of these since 1986; about 50 are in force at present. We have many other contractual arrangements covering collaborations. For example, we have about 200 Industrial Research Associates at work at the Institute under agreements tailored for this purpose. We have hundreds of other guest workers and visiting academicians, some for short periods with no contracts, and some for a year or more under special agreements. We find all of these arrangements effective. In fact we are very flexible in the way in which we deal with industrial collaborators. An important point is that the Institute, unlike most other Federal laboratories, is chartered to work with industry. It is our job to build partnerships to define projects jointly and to hand off the findings to the industrial clientele. In most other laboratories the central mission is something else and transfers to industry are largely unintended spin-offs. Not so for us.

Formal interaction between the Institutes and industry have increased considerably during the 1980's. We made a deliberate

decision to double the number of Industrial Research Associates from about 100 at the beginning of the decade to 200 . We accomplisned this goal in about five years. We have assembled a number of small consortia of industrial firms as sponsors of specific Institute laboratory projects. Each participant puts in a few tens of thousands of dollars and gets back the results of an effort many fold larger. This approach builds in both participation in project definition and also transfer of the findings. Industry participation in Institute work through donations and loans of equipment and software, loaned staff and, occasionally, cash contributions, now approaches $60 million annually and, if we include fees for services such as calibrations of instruments, the number rises to $72 million. This is up by a factor of about two from ten years ago.

It is clear that there has been a sea change in attitudes in the Government toward collaboration with industry and the importance of strengthening the economy in global competition. This change has encouraged and enabled the Institute to move into much closer industrial relationships.

NIST's Role in Aiding U.S. Industrial Technology

15. You have served in both industry and as Director of NIST's National Engineering Laboratory. In your judgment, why do American companies so often lag behind foreign firms in both the quality of their manufacturing and the speed with which they turn new ideas into successful commercial products? What steps can and should Federal technical agencies take to help U.S. companies improve their performance in these areas? How important are new quality assurance techniques to improving both problems?

A. Many U.S. industrial firms are having trouble competing in the global marketplace and this shows in various economic indicators such as the current accounts and figures on world-wide market share. There are many reasons being advanced for this, including disadvantages in finance, tax, intellectual property, and skilled labor matters. And we are not getting the most out of our very considerable talents in science and engineering. I address only this last area. Our posture in science and engineering research appears healthy - we still win most of the prizes and our colleges and universities provide outstanding graduates in the technical subjects. We are still extraordinarily creative and continue to build a large fraction of the first prototypes of new products. Where we are falling down is in using our science and technology in going to market. Symptoms of this technical problem show up in poor performance in quality, cost, and speed in going to market. Federal technical agencies can do something about these problems. I'll discuss the Institute's approach by way of example.

In general the Institute works on product and process problems at the generic or precompetitive level where information is shared within the technical community. The Institute tries to stay away from proprietary areas in the belief that that is the private sector's responsibility. We do try to provide supporting technical services that will help industry develop products and processes and some of these services are useful to industry at all stages of commercial development. Here are some illustrative examples:

In the new area of high-temperature superconductors the Institute is studying how to make thin films useful in electronic devices. Someday this will be a proprietary matter but it is so early in the evolutionary history that the community is sharing widely new knowledge. We are in the generic and precompetitive stages.

In chemical process technology there are many technical needs in support of improved process control. The processes in general are proprietary and information is very closely guarded. The Institute works on the properties of process fluids such as steam and on improved sensors for measuring components of the process stream for more efficient control. The new data and sensors are generally not considered by the industry to be proprietary and are widely shared. Everyone would like to have the best data on material properties possible. The better the data the more

effective the process design and the more efficient the process performance. Closer control in general means higher quality, less rejects and hence lower costs.

The Institute's recent well-publicized work in automated factory control through applications of microprocessors - computer-integrated manufacturing - has clearly shown substantial impacts on quality, cost, and speed. The computer can map out errors in machines and automatically correct for them such that no rejects are produced. We believe that measurements for quality assurance should be made on the process (machines) not on the products. Keeping the errors on the machines under continuous control will guarantee quality products. This means that quality measures are built into process sensing and control and will no longer be separate from the production line. This is a little-recognized but key result of the computer revolution in production. A corollary is that computerized design followed by automatic programming of the computer-controlled machines on the factory floor for the first time permits industry to make design changes in products almost on the fly and to make lot sizes as small as one each economically.

The Institute is stressing these kinds of technical programs in its planning. The results should be improved productivity and competitiveness for our industry.

16. A May 15, 1989, DOD report states that Japan is now significantly ahead of the United States in six key technical areas -- microelectronic circuits, gallium arsenide semiconductors, robotics, optics, superconductivity, and biotechnology materials and processing. Do your NIST assessments of U.S. and Japanese technology agree with DOD's findings? If so, do you believe that American industry can long remain successful if it loses the technological edge in these critical areas? In your judgment, what are the implications of this trend for U.S. economic and military security and for the nation's wages, wealth, and standard of living?

A. Both DoD and DoC have made assessments recently of how the U.S. is doing in advanced technology versus our off-shore competitors. In our assessments we try to judge relative status and the direction of the trends in terms of research, on the one hand, and in new product commercialization on the other. It is often the case that one nation will be ahead in the research but another is reaping the benefits by getting to market first. I have discussed some of the reasons for this above. I think there is consensus that Japan is ahead in marketing dynamic random access memories (DRAMs). On the other hand I think the U.S. makes the best microprocessor chips in the world. So one has to be careful with general statements. I believe Japan does an outstanding job in assuring quality in their integrated circuits and in the silicon and gallium arsenide materials used in making them. I also believe that the trend lines in electronics are negative; that is, where we are ahead our lead is diminishing. And this is true for most of the important emerging technologies. Not only do we agree with the DoD assessments but we find that all such assessments are saying the same things, none of them very encouraging.

The implications of this are clear. The dominant economic sectors of the next century will come from the emerging technologies of today. He who has the technology well in hand will be in a position to be a world economic leader. I say "in a position" because technology is only one of the key factors that must be handled properly to achieve success. I also believe it is now widely recognized that our national security in the next century will depend largely on our economic success. Technology is one of the keys to maintaining this security.

17. The Federal government now spends some $65 billion annually on research and development (R&D). Although defense and space projects produce some commercial "spillovers," official National Science Foundation (NSF) statistics show that in 1987 (the latest year for which figures are available) the U.S. government devoted only 0.2 percent of total R&D funds to support research directly related to industrial development. The comparable West German figure was 15.3 percent. In your judgment, what steps should be taken to ensure that the U.S. government's huge investment in R&D becomes more directly helpful to U.S. industry?

A. There has been much discussion in recent years of how to get more economic benefits from the $70 billion dollar Federal research and development investment. Most of this has concentrated on stimulating technology transfer from the Federal laboratories to the private sector. While this has had some encouraging results I believe there are serious obstacles to achieving major success via this approach. The principal problem is that most of the Federal laboratories have missions that are not related to the civilian economy. Thus the technical work is not planned with industry and the results are in general not suited for industrial use. The technologies developed in these laboratories must be redone in many cases to render it suitable for private sector economic applications. This takes money, sometimes a great deal of money. For small businesses the funds are not available; large businesses often just decide to start from scratch.

An effective way to get more impact on the private sector of the research and development investment in the Federal laboratories is to concentrate on the front end of the research and

development process instead of the back end as we are now doing. By the front end I mean the mission, strategy, and planning of the labs. Only by changing the mission and writing civilian technology development into the lab strategies can the bulk of the work have an impact on the private sector. Planning projects should be done jointly with industry, joint programs should be undertaken, staff should be shared as well as resources. We either do these things at the Institute or are gearing up to do them. But we have the advantage of having the mission already clearly stated in law. Recall that only the Institute and NIH have their own separate authorization and appropriation statutes and therefore have the advantage of having their missions and purposes restated and endorsed each year by the Administration and Congress. Most of the other labs have no direct appropriations and their assignments come from other parts of their agencies. This is certainly true of the laboratories I work closely with: the Naval Research Laboratory, Oak Ridge, Argonne, etc. If we really want to involve these great laboratories in our economic future, major changes in mission and management approach will be required.

18. Critics of government assistance to industry-led research projects -- assistance that has proven so successful in Japan -- often argue that Japan's values and economy differ greatly from America's and therefore should not be imitated here. However, West Europe and particularly West Germany also have extensive and successful programs to aid industrial technology, and those countries have free enterprise systems very similar to America's. In your judgment, what lessons can the United States draw from the technology policies for Europe and Japan? In particular, what lessons do they offer regarding quality assurance, technology extension activities and consortia to develop new generic enabling technologies?

A. I am very familiar with the debate over government assistance to civilian technology having contributed to it myself. I have studied the approaches taken in Japan with care and a few years back wrote a report on the Japan Key Technology Center. I am also well aware of programs in European countries such as the Fraunhofer Institutes in West Germany and the JESSI effort in the Common Market. I think we can learn from all of this but we must then go our own way. Conditions here are not the same as anywhere else and are not likely to be the same. This applies to attitudes and culture as well as to financial markets and tax policy. So it is not useful to try to generalize too much from country to country. I do take it as a major challenge to the United States that so many other countries are operating in many areas of high technical content as corporate states, by which I mean centrally planned and directed economic activities. We must respond to the challenge, but in our own way.

I think we are learning from our off-shore competitors. We now have our own way of cooperating to strengthen ourselves. We have many consortia at work sharing research and development programs.

SEMATECH is only the largest; there are many smaller ones. In the early 1980's we changed our intellectual property regulations and our anti-trust laws. The President has proposed further changes in the anti-trust statutes. The hostility that existed between industry and government when I came to Washington in 1973 has been replaced in many areas with a spirit of cooperation. I see that at the Institute very plainly and am encouraged by it. I find the concept of "industry-led technical programs" very helpful. We at the Institute have always sought industry guidance in program planning and priority setting. We would not mount a new program if industry had not already confirmed the strong need for it and helped us put the proposal together. This is what it means to run a laboratory chartered to help industry. Incidentally such an approach virtually guarantees that transfer of the technical results to industry will be very easy because the recipients helped design the program in the first place.

I believe we shall see in the years ahead many more joint endeavors between the Institute and industry in which staff and resources from both sectors are joined in research projects - some at the Institute, some elsewhere. I think we should do more. Such joint efforts will almost always be with groups of companies - consortia - or with programs put together by representatives of companies - trade associations and the like.

19. What specifically do you believe that NIST should do in the 1990's to help provide the tools that American industry needs (a) to spread the commercialization and reliable, cost-effective production of new emerging technologies such as high-temperature superconductors and high-resolution displays, (b) to improve manufacturing quality, and (c) to make steady incremental improvements in both products and production processes?

A. I believe the Institute can continue to be helpful as industry strives to improve its competitiveness. First, I believe the Institute should build on its strengths and continue to develop the supporting technical services it has traditionally provided to industry. These services - measurement techniques, data, reference materials, calibration services, protocols for software interfaces, formats for data, and proposed standards and codes - are essential to the functioning of industry and must be maintained. The demand for such services is increasing every year as the business world becomes more complex technically. So a top priority will be to continue to strengthen these areas.

We have for the past decade and more been tying our new programs to new, advanced technologies in the belief that these will be the leaders for our economy in the future. Thus we have channeled our efforts into such areas as biotechnology and bioprocessing, semiconductors and superconductors, optical communications, advanced materials, automated manufacturing, computer networking, and computer security. We shall continue to concentrate on these new technologies aggressively by internal management actions and by our proposals for resources.

We have shifted emphasis somewhat in our work from a focus on the properties and behavior of products to the manufacturing processes needed to make products. Thus in our materials programs we are working on how to process rapidly solidified powders into shapes as opposed simply to characterizing the powders, and how to process composites and advanced ceramics rather than just publishing data on these new materials. Our factory automation program is entirely directed to processing. And our work on bioprocess engineering is aimed at the design problems in scaling up, from the laboratory to the factory, processes to make biochemicals such as new genetically engineered drugs. We shall continue to place emphasis on processing, particularly on those aspects that are generic to families of products, and we shall stay out of specific and proprietary areas.

These services are all aimed at improving the cost and quality of our products. In addition, some of our services are also aimed at speeding our response to market changes by enabling concurrent or parallel actions in engineering and production thereby shortening turnaround times. Often speed in responding to market demand is as important as price.

In addition to supplying technical services from our laboratory work we shall also operate the new external programs assigned to us in the Technology Competitiveness Act of 1988: particularly the regional centers for the transfer of manufacturing technology and the advanced technology program. And we shall continue to operate

the Malcolm Baldrige National Quality Award. This last program, funded by private sector but managed by the Institute, is having a major impact on industry by increasing the motivation to look closely at quality programs and to learn how to do it better.

20. There has been much recent attention to the role of standards testing and certification in U.S. national competitiveness. For example, standards testing and certification will play a key role in maintaining U.S. access to the European Community's post-1992 internal market. What do you believe should be the relationship between NIST and the U.S. private sector standards community? Do you favor maintaining the traditional arrangement by which private sector groups set voluntary consensus standards, or do you believe, as do some observers, that America needs a quasi-governmental Standards Council of the United States of America?

A. The fundamental relationship between NIST and the private sector standards community should continue to be technical. Some 413 NIST staff members presently serve on 844 committees, subcommittees and working groups representing 81 different standards bodies (57 U.S.; 24 international). We chair 118 committees and subcommittees. A fair portion of our laboratory work is connected to problems that arise in the deliberations of these committees. The committees are a principal channel to the private sector for our technical findings. I don't see this changing.

I also believe that we should continue to set product standards in the United States via the private sector. In the past the only time the Federal government became involved was when the private sector mechanism was inadequate or broke down.

The rising concern over international competition and the role of product standards in international trade has led some to question whether our pluralistic, private sector approach to standards is going to prove adequate. To address this question NIST has called a public hearing in April of this year. At this hearing we expect to receive a number of statements pro and con in regard to any increased Federal role in product standards. Only after reviewing the results of this hearing and talking to many different groups will NIST be ready to draw any conclusions.

STATEMENT OF DR. JOHN W. LYONS

Dr. LYONS. Thank you, Mr. Chairman.

I am John W. Lyons. I am honored to be President Bush's nominee for the position of Director of the National Institute of Standards and Technology. I am grateful to Secretary Mosbacher and Deputy Secretary Murrin for recommending me to the President.

I appreciate the presence of Congressman Sherry Boehlert of Utica, New York, Ranking Minority Member of our Oversight Subcommittee in the House. I also thank Congresswoman Morella, in whose district the Institute is located, for coming with me today. It makes me feel very good. My statement has nothing to do with Shakespeare, however.

If confirmed, I look forward to working closely with the United States Congress.

I shall now summarize my qualifications and what I believe the mission and the programs of the National Institute of Standards and Technology will be in the 1990s.

This committee is familiar with my qualifications and record. I shall quickly summarize a few key points. I was trained as a scientist, and I have done research, managed research and development and managed new business development. I worked with these assignments for 18 years in the chemical industry. For the past 16 years I have managed research at the National Institute of Standards and Technology. For the past dozen years I have been in charge of creating and building the programs of the Institute's National Engineering Laboratory.

I believe that my experience, divided as it has been between industry and government, will stand me in very good stead should I be confirmed as Director of the Institute. As I shall show in what follows, the relationships between this Federal laboratory and industry will be all important in the years ahead.

The National Institute of Standards and Technology is unique in being the only large Federal laboratory with the primary mission to assist industry. The Institute was rechartered in the Technology Competitiveness Act of 1988. The language of the enabling legislation was modernized, and support for industry was raised to the head of the list of functions. This support for industry is to come in a number of ways.

The statute uses terms and phrases such as quality, product reliability, modernized manufacturing processes, manufacturability, functionality, cost effectiveness and the like. The statute also urges us to focus on manufacturing technology and on aiding industry and commercializing the latest technologies.

The Institute has laboratory programs in chemistry, physics, materials, various engineering areas, computing and applied mathematics. These programs are supported and augmented by our extramural programs designed to help transfer our technical findings to the users and to increase the ability of the users to absorb and commercialize technology. These extramural programs include the regional centers for the transfer of manufacturing technology, the State technology extension program, the advanced technology program, and others.

We have been building our programs in recent years in what we have come to call the emerging technologies. Some of these are fiber optic communications, bioprocess engineering, advanced materials, advanced electronics, robotics, and advanced computing technology.

We have also been gradually shifting our emphasis from the characterization of products to the manufacturing processes for making them.

I believe the Institute can best help industry by providing technical assistance that is generic in nature. This means the Institute's findings are and should be available to all and that, in general, the Institute should stay out of proprietary areas.

If I am confirmed, I shall support and encourage the Institute's work on the basic physical and chemical standards of measurement on which our national quality assurance systems are based and shall attend to providing the necessary services to all those seeking to base their work on ours.

I shall continue to provide all necessary support for the Malcolm Baldridge National Quality Award.

If confirmed, I shall increase emphasis on doing more generic precompetitive research on product and process commercialization. These are going to come mostly from the emerging advanced technologies.

I shall continue to emphasize manufacturing processes.

I expect that we shall do most of the work related to product and process development in collaboration with industrial partners.

If confirmed, I hope to continue and expand my working relationships with the Congress. The several new authorities for extramural work given to the Institute in the Technology Competitiveness Act of 1988 make it clear that Congress intends to make use of the Institute in funding activities outside our laboratories. These are new challenges for us. We expect to develop these new extramural programs as a team effort within the Technology Administration, drawing on all the resources of the Department of Commerce.

Mr. Chairman, I believe the National Institute of Standards and Technology is a national resource of consequence. I am honored to be the President's nominee to lead this great laboratory. I shall be pleased to answer any questions you or Members of the committee may have.

Thank you.

Senator GORE. Thank you very much. Is it true you have a daughter living in a Communist country?

Dr. LYONS. Yes, sir, it is.

I should explain. I did not yesterday. She is a member of the staff of the Department of State and resides in Beijing, China, with her husband.

Senator GORE. I was aware of that when I joked with you yesterday about that, but is it true that you are an expert on viscosity?

Dr. LYONS. A sometime—or "erstwhile expert" I think is the correct term.

Senator GORE. Well, let me ask you some serious questions about administration priorities. How serious is the administration in your view about promoting economic competitiveness?

Dr. LYONS. I can speak only for the Department of Commerce within which I work, and I can speak, I think, for the Secretary of Commerce because I attend his senior staff meetings regularly. Last Saturday morning we had a meeting to discuss the future, and in particular the rest of this fiscal year. He put competitiveness at the top of his list and included as one of the three primary goals the topic of technology as it relates to competitiveness. So, in his planning and conceptualizing, the Secretary is putting that very high on his list.

Senator GORE. Rhetorically or in terms of the budget?

Dr. LYONS. At the moment in terms of planning. In a matter of days or weeks on the budget that will be formulated, we are going to start for FY '92.

Senator GORE. It is a real tiny part of the budget. You really have to get a top-of-the-line magnifying glass in order to find the percentage allocated to helping, directly helping industrial competitiveness.

I mean, I do not want to sound overly sarcastic about it, but seriously it is a very tiny part of the overall R&D budget, and I ask the question as I do in order to use this forum in a small way to tell the administration that there are several of us on this committee—and I think it is fair to include Senator Hollings in this expression of sentiment—that we feel more attention should be paid to directly helping the ability of our industry to compete overseas.

Dr. LYONS. If I could just make one comment, sir, I understand and appreciate your concern. I would like to point out that the President's budget for NIST is a plus 23 percent which, given the history of the last ten or 20 years, we think, is a wonderful start for our institution.

Senator GORE. Right. And 23 percent of a tiny amount is still a tiny amount, but it is movement in the right direction, so we will give you credit for that and give the administration credit for that.

But given the serious challenge we face, many of us continue to believe that more is needed, and we are seeing less for industrial technology support than the amount of increase in the request for the Superconducting Super Collider and that, it seems to me, is an accurate statement of where the priorities are in the science budget of the administration.

I am not opposed to that project, but you look at the amount of money, the amount of money allocated for some of these megaprojects, and the very tiny sums allocated to help our industry as a whole compete overseas, and it is really striking.

On the NIST laboratory program, I am pleased to see the administration has requested a major increase for laboratory research and technical support programs of NIST. What kinds of initiatives would the new $40 million there support?

Dr. LYONS. Mr. Chairman, I did not bone up on the budget, but I can tell you in general outline about advanced technologies. I know one of the very top items is for fiber-optic technical services. We have talked about that before in connection with data networks and advanced computing.

Every year, I think, we have money in for advanced materials work. There is some in there for our computer security which is an

item of increasing concern. We have work on intelligent processing of materials and robotics—some of which was highlighted in the Washington Post, I believe, last week. So, it is a string of these advanced technologies, most of which come out of what we call "emerging technologies."

Senator GORE. Well, we will give you a chance to supplement any of these responses for the record if you wish to.

Since you bring up the advanced computing initiative, as you know, the Federal Coordinating Council for Science, Engineering and Technology, the FCCSET, under the supervision of OSTP, has recommended a new high performance computing initiative based upon the legislation coming out of this committee which I have pushed for several years now. The cost is very small, $375 million per year for five years with the creation of a trust fund that could, once the traffic starts flowing, more than pay back the public's investment many times over.

But in spite of statements of support, the administration still has failed to recommend any significant or adequate funding for this initiative. In fact, they have not requested any fiscal year '91 funds to implement NIST's role in the high performance computing initiative.

Dr. Bromley said publicly in this room that he felt this should be the nation's number one priority in science and technology.

Given the size of the U.S. computer industry and the importance of advanced computing to researchers in and out of the federal government and the chance for the United States to really lead in this area, why is the administration and why is NIST not putting a higher priority on high performance computing?

DR. LYONS. Mr. Chairman, I cannot comment on what happened in the budget process. I was not privy to the formulation of that at the level of OSTP and OMB.

I can say that NIST has this very high on its list, but we are not working so much on the specific end products as on the enabling technologies that make that possible, which is the typical, traditional NIST role.

And, in fact, I can list the same technologies whether I am talking about advanced computing in what we call the "national data highway" or, if I am talking about advanced imaging, what used to be called HDTV. We are working on the technologies that relate to that.

First, I would point to our work in fiber-optics which I indicated earlier was our top lab priority.

Second, we have work on protocols for the integrated systems digital network, commonly know as ISDN, which begins with narrow band or current telephony technology, but for the advanced computing network one has to get to tens of gigahertz, as you know, and that is what is called "broad band ISDN protocol." We are busily at work on that and have a lot of things going.

Then we have our semiconductor program which, in the President's budget, is slated for an increase, and which relates to processing chips. Finally, the list includes microwaves; we have had for many years a solid program in support for the microwave industry.

So, we have a number of these enabling technologies to which I do give very high priority.

Senator GORE. Well, let me say that I have a series of other questions on high definition displays, the advanced technology program, alternative refrigerants, fire prevention, manufacturing technology centers, computer security and a few other areas. These are questions I intend to pursue with you in further hearings this year.

I say that because the bells indicate that we are now halfway through a vote in progress on the floor on the excellence in education bill and we have two options. We can conclude this hearing now or come back to hear all of those who are objecting to your nomination. And since there are none, I guess it makes sense to conclude the open record here.

Well, in conclusion let me again thank you for coming here today and congratulate the administration on this nomination. I foresee no problems at all. You have many friends here on Capitol Hill, and I look forward to continuing our working relationship, and I wish you very well as this hearing concludes.

Dr. LYONS. Thank you, Mr. Chairman.

[Whereupon, at 3:08 p.m., the committee adjourned, subject to the call of the Chair.]

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